

REMARKS

The present Preliminary Amendment is responsive to the prior Office Action dated October 15, 2001. Claims 1-29, 31, 33-35, 37-39, and 41-42 are pending in the present application. Claims 1-27 and 42 were withdrawn from consideration as being directed to a non-elected invention.

The Drawings

The Examiner's approval of the drawing changes dated February 14, 2001 was appreciated. However, some objections to the drawings were maintained.

At item 3A on page 2 of the office action, the terms Q and Pm in the drawings were still objected to. The Applicants submit that these terms are supported in the specification and well understood by those skilled in the art. It is also noted that Q and Pm are identical in value and there is no ambiguity with regard to the vertical axis in Figs. 3-13, especially since the specification clearly states that "the vertical axis represents the partial peressure of the released species in terms of Torr." Nevertheless, to move the prosecution of the case forward, changes to the drawings are submitted concurrently with this Preliminary Amendment to use the specific language employed in the specification to describe the vertical axis.

At item 3B on page 2 of the office action, Figs. 9-12 were objected to for alleged different or inconsistent power levels. However, the Applicants submit that Figs. 9-12 are correct. What the Applicant are doing in these drawings is to compare the H₂O and OH content in an SiO₂ film formed with various RF powers with the H₂O or OH content of the reference SiO₂ film formed with the

conventional power of 200W. Thus, the comparison of experiments between different electric powers is not in fact a contradiction.

At item 3C on page 3 of the office action, correction to the drawings was requested to clear up lines which cross and overlap. With regard to Figs. 3-13, the proper labeling exists for those lines, at least for a part thereof, essential for understanding the description in the present application. In the concurrently submitted drawing changes, the parts of the lines that were explained in the specification are highlighted with redlined hatch lines.

The Specification:

Item 4 on page 3 of the Office Action identified three specific instances which required correction in the specification. The specification was amended above to clarify the description of the present invention. It is submitted that no new matter was added for the following reasons.

Page 15, line 5, was amended wherein " H_2O " has been changed to read -- SiH_4 --. Applicants submit that this change is supported by the corresponding descriptions on page 15, line 12 and page 16, lines 19-20 of the present specification.

Page 15, line 27, was amended wherein " $200^{\circ}C$ " has been changed to read --200W--. Applicants submit that this change is supported by the description on page 15, line 5 of the present specification.

Page 16, line 15, was amended wherein " H_2 " has been changed to read -- H_2O --. Applicants submit that this correction is obvious from other parts of the specification.

Page 17, line 15, has been amended wherein "FIG. 10" has been changed to read --FIG. 8--.

Applicants further comment on this amendment below.

Page 27, line 15 and page 20, line 12, were amended wherein "50 kW" was changed to read --50W--. Applicants submit that this change is supported by the description on page 17, lines 24-25, claims 3 and 4, and the like.

Page 16, line 27 was re-amended (from the Feb. 14, 2001 Amendment) to correct "2000W" to be --200W-- due to an apparent typographical error.

Substitute Specification

The Office Action required a substitute specification "because Applicant has been given able opportunity to correct the above-cited problems, both in the drawings and the written description, but has failed to correct or address all of the examples cited by Examiner, yet alone all the errors in the specifications." The Examiner goes on to state that "it would be too cumbersome for both the Examiner and the printer to piece together changes spread out over several amendments."

While the Examiner believes that it is "too cumbersome" to make changes allegedly "spread out over several amendments", the Examiner should note that there was only ONE prior amendment that was entered. In particular, *only* the **February 14, 2001** amendment was entered. The prior amendments filed on June 7, 2000 and October 12, 2000 were **NOT** entered according to the subsequent office actions. The Feb. 14, 2001 Amendment superceded the prior amendments that were deemed not fully responsive to the office action. Only the Feb. 14, 2001 and the current amendments are to be entered. Accordingly, a substitute specification is not currently needed.

Summary of the Invention

At Item 23 on page 11 of the Office Action, the Examiner admits that the Summary can include claim language, but asserts that is not the issue. According to the Examiner, "the issue is whether, seven pages of mostly claim language that numerously repeats basic steps in building a MOSFET, provides a summary which is in 'full, clear, concise, and exact terms'."

However, it should be noted further that 37 C.F.R. § 1.73 merely requires the Summary of Invention to "be commensurate with the invention as claimed and any object recited should be that of the invention as claimed." There is no statutory basis in 35 U.S.C. and no U.S. Patent and Trademark Office rule under 37 C.F.R. which requires the Summary of the Invention to be in "full, clear, concise, and exact terms" as alleged by the Examiner. Only as a matter of guidance, MPEP §608.01(d) mentioned the Summary to be in "full, clear, concise, and exact terms" - but without diminishing or expanding the actual requirements of 37 CFR §1.73 for the Summary to be "commensurate with the invention as claimed." It is submitted that the present Summary of the Invention satisfies the requirements under 37 C.F.R. §1.73 in that it is "commensurate with the invention as claimed ..."

Moreover, concise and pertinent descriptions of the invention (and not mere repetition of the claims) was provided in the Summary section. For example, page 6, line 31 to page 7, line 9; page 9, lines 5-17; page 10, lines 20-27; and page 13, lines 12-23 are not duplications of claim language and sufficiently inform the public of the nature of the invention, in conjunction with the other descriptions in the Summary section of the specification. It is submitted that the present Summary of the Invention section meets all the requirements under U.S. patent law and under USPTO rules.

Items 7-10 on pages 4-6 of the Office Action are also directed to alleged deficiencies in the Summary of the Invention section of the present specification.

For instance, at item 7, the Examiner alleged that "claims are written in legal language to specify in broad terms the legal limitations of the invention, and are not intended to provide technical information to the public about the nature of the invention." This is incorrect and contradicts well established U.S. patent law. Although claims are subject to legal interpretation, the language of the claims are still descriptive of the invention and serves to inform the public of the nature of the invention in a clear and concise manner. It is well established U.S. patent law that even the originally filed claims may constitute a source for written description and enablement support of the invention.

At item 8, the Examiner referred to the first paragraph of 35 USC §112 and then concluded that "the legal language utilized for claims to set the meets and bounds of the patent protection does not fulfill this requirement". This is incorrect. It is well established U.S. patent law that the language of originally filed claims contribute to the written description and enablement requirements under 35 USC §112, first paragraph.

At item 8, the Examiner further alleged that "since the Summary of the Invention merely duplicates the claims, it is not providing support for the claims". There are numerous errors in this misstatement. First, support for the claims come from the application as a whole, including the detailed description of the invention section of the specification. Second, antecedent support for claim language may be provided by using the same language in the specification, including use of the same language in the Summary of the Invention section.

At item 9, the Examiner referred to 35 USC §112, second paragraph and then concluded by alleging "since the claims are given at the end of the specification, it is redundant and superfluous to include them as part of the summary." This conclusion does **not** follow from the requirements of 35 USC §112, second paragraph. There is no requirement under U.S. Patent Law that forbids an applicant from using claim language in the Summary of the Invention section of the specification.

At item 10, the Examiner referred to USPTO rules identifying a Summary of the Invention Section and a Claims section for an application, and then concluded by saying "the intended objective was not to provide an exact copy of the claims in the summary". However, there is no rule nor statute prohibiting an applicant from repeating language of a claim in the Summary of the Invention section of the specification.

No New Matter

At Item 11 on page 6 of the Office Action, the Examiner objected to the amendments to the specification because they allegedly added "new matter" into the disclosure of the invention. The amendments to pages 16 and 17 of the specification were made to refer to the correct figures. In particular, page 16, line 27 was amended to correct "Figure 5" to --Figure 4--. Page 17, line 9 was corrected to change the reference to "Figure 10" to --Figure 11--. The Examiner alleged that such changes constituted new matter. On the contrary, the Applicant submits that no new matter was added, as explained below.

On page 16, line 27 of the present specification, the passage following the amended passage made a reference to FIG. 4 and states that "SiO₂ film deposited under the plasma power of 200W contains a large amount of H₂O and OH." Please note that FIG. 9 compares the H₂O and OH content in the SiO₂ film formed at the plasma power of 200W, with the reference sample of FIG. 3. The only SiO₂ film formed at the plasma power of 200W other than the reference sample of FIG. 3 is the sample of FIG. 4. Thus, Applicants submit that the amendment from "FIG. 5" to --FIG. 4-- is clearly supported by the original disclosure of the present invention.

In relation to above, please refer to the paragraph starting from page 16, line 32, in which comparison is made between the SiO₂ film deposited under the plasma power of 100W(FIG. 5)with the reference sample of FIG. 3. Thus, "FIG. 5" on page 16, line 29 cannot be FIG. 5. Applicants submit that the amendment submitted previously is supported also from this description and does not constitute new matter.

With regard to the amendment of page 17, line 15, the replacement of "FIG. 10" with --FIG. 9-- in the previous response is an error, and this should be the replacement of "FIG. 10" with --FIG. 8--, which shows the refractive index of 1.62 (see also the description in page 116, lines 19-26). Applicants submit that this correction is fully supported by the original disclosure.

Rejections Under 35 U.S.C. §112, Second Paragraph:

Claims 28-29, 31, and 33 were rejected under 35 U.S.C. §112, second paragraph because independent claim 28 contained an apparent typographical error. Claim 28 was amended above to recite "first insulation film contains H₂O".

Rejections Under 35 U.S.C. §103:

Claims 28, 29, and 33 stand rejected under 35 U.S.C. §103 as being unpatentable over **APA** in view of **Toyotaka** and **Oda**. The prior art rejections were based on the Applicants' admitted prior art (**APA**), **Toyotaka** (JP 07-135208), **Oda** (JP 06-204420), **Wolf** (Article entitled, "Silicon Processing for the VLSI Era"), and **Lage et al.** (U.S. Patent No. 5,485,420). It is submitted that the cited prior art does not teach or suggest all the features recited in the present claimed invention, and fails to provide the proper motivation to achieve the present claimed invention. As stated by the Federal Circuit:

"To prevent the use of hindsight based on the invention to defeat patentability of the invention, this Court requires the Examiner to show a motivation to combine the references that create the case of obviousness. In other words, the Examiner must show reasons that the skilled artisan, confronted with the same problems as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior references for combination in the manner claimed." *In re Roufett*, 47 USPQ 2d 1453, 1457-58 (Fed. Cir. 1998).

The rejections have not met the requirement set forth by the Federal Circuit. Not only does the Examiner identify *different* motivations to combine, but also, the Examiner has not and cannot show "reasons that the skilled artisan, confronted with the *same problems* as the inventor and with no knowledge of the claimed invention, would select the elements from the cited prior references *for combination in the manner claimed*."

The U.S. Supreme Court, in *Eibel Process Co. v. Minnesota and Ontario Co.*, 261 US 45 (1923), established the rule that the discovery of the source of a problem may result in a patentable

invention despite the fact that the solution would have been obvious once the source of the problem was discovered. See also, *In re Peehs*, 204 USPQ 835, 837 (CCPA 1980); *In re Nomiya*, 184 USPQ 607, 612 (CCPA 1975) ("[where] there is no evidence of record that a person of ordinary skill in the art at the time of [an applicants'] invention would have expected [a problem], ... it is not proper to conclude that [an invention], which solves this problem ... would have been obvious to that hypothetical person of ordinary skill in the art. The significance of evidence that a problem was known in the prior art is, of course, that knowledge of a problem provides a reason or motivation for workers in the art to apply their skill to its solution.").

Here, the prior art and those skilled in the prior art did not even recognize the problem addressed by the present inventors. The **APA** merely teaches the background of the present invention and is entirely silent about the use of specific H₂O content in the first insulation film. **Toyotaka**, on the other hand, merely teaches the removal of H and H₂O from the gate insulation film. Further, **Oda** merely teaches the art of forming a salicide on the surface of the diffusion regions.

As Applicants have submitted before, the present invention was made based on the discovery, made by the inventor of the present invention, and explained in detail in the specification with reference to FIG. 2, of the problem of OH trapping, which occurs in the self-aligned contact structure, in which the first etching stopper film 6 of SiO₂ is covered by the second etching stopper film 4 of nitride. More specifically, the nitride film 4 blocks the escape of H₂O molecules from the SiO₂ film 6, and the OH ions originating from the trapped H₂O molecules cause diffusion to the gate insulation film and form surface states therein.

In order to avoid the problem, the present inventors came to the inventive concept of suppressing the H₂O content in the first insulation film as set forth in claim 28.

In view of absence of the knowledge of the problem explained with reference to FIG. 2, there is no motivation for a person skilled in the art to combine the teaching of the **APA** with **Toyotaka** or **Oda** to achieve the especially beneficial effect, which appears when the self-aligned contact structure is used. Please note that **Toyotaka** addresses the problem of film quality of gate oxide film, while the present invention deals with the etching stopper oxide film. Although it was discovered by the study of the inventors of the present invention that the H₂O accumulation in the first insulation film ultimately affects on the gate insulation film, this is by no means an obvious matter for a person skilled in the art at the same time the invention was made.

Thus, Applicants submit that the rejections based on the cited prior art combinations constitute mere impermissible hindsight. For at least these reasons detailed above, the present claimed invention patentably distinguishes over the prior art.

Claims 34, 37, 38 and 41 stand rejected under 35 U.S.C. §103(a) as being unpatentable over **APA** in view of **Wolf** and **Oda**. The argument above with regard to the **APA** applies here also. Moreover, **Wolf** is silent also about the self-aligned contact structure and there is no motivation to combine the teaching of **Wolf** with the **APA**.

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Applicant: Kousuke SUZUKI, et al.

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Summary

It is submitted that nothing in the prior art, either alone or in combination, teaches or suggests all the features recited in the present claimed invention. Reconsideration of pending claims 28, 29, 31, 33-35, 37-39, and 41-42, and an Early Notice of Allowance are earnestly solicited.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached page is captioned "**VERSION WITH MARKINGS TO SHOW CHANGES MADE.**"

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney, at the telephone number indicated below, to arrange for an interview to expedite the disposition of this case.

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In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. The fees for such an extension or any other fees which may be due with respect to this paper, may be charged to Deposit Account No. 01-2340.

Respectfully submitted,

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PATENT TRADEMARK OFFICE

Enclosures: VERSION WITH MARKINGS TO SHOW CHANGES MADE
Request for Approval of Drawing Changes

VERSION WITH MARKINGS TO SHOW CHANGES MADE
U.S. Serial No. 09/045,118

IN THE SPECIFICATION:

The paragraph beginning at page 15, line 24, has been amended as follows:

--Referring to FIGS. 3 and 4, it can be seen that a substantial release of H_2O and OH occurs in the SiO_2 film deposited under a conventional plasma power of ~~200°C~~ 200W immediately after the start of the heating. The release of H_2O and OH continues even when the temperature reaches 1000°C.--

The paragraph beginning at page 16, line 1, has been amended as follows:

--Further, FIG. 7 shows the release of H_2O and OH from the SiO_2 film deposited on the Si substrate at a substrate temperature of 400°C and a plasma power of 100W for a case in which the ratio of N_2O with respect to H_2O SiH_4 in the gaseous source is set to 10. In this case, the SiO_2 film obtained as a result of the plasma CVD process has a refractive index of about 1.5. In contrast, it should be noted that the SiO_2 film obtained in FIG. 5 has a refractive index of about 1.47. Further, the SiO_2 film of FIG. 3 shows a refractive index of about 1.45.--

The paragraph beginning at page 16, line 12, has been amended as follows:

--As can be seen in FIG. 7, the amount of H_2O and OH incorporated into the SiO_2 film is reduced further as compared with the case of FIG. 5. It is believed that the foregoing decrease of H_2O and OH content in the SiO_2 film

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observed in the case of FIG. 7 is caused by the increased amount of Si-H bond in the SiO₂ film.--

The paragraph beginning at page 16, line 27, has been amended as follows:

--FIG. 9 shows a differential in which the result of FIG. 3 is subtracted from the result of FIG. 4. As already explained with reference to FIG. 4, the SO₂ film deposited under the plasma power of ~~2000W~~ contains 200W contains a large amount of H₂O and OH.--

The paragraph beginning at page 17, line 9, has been amended as follows:

--Further, FIG. 12 shows a differential in which the result of FIG. 3 is subtracted from the result of FIG. 7 in which the deposited SiO₂ film has a refractive index of 1.5. In this case, the amount of release of H₂O and OH is reduced further. In contrast, FIG. 13 shows the case in which the result of FIG. 3 is subtracted from the result of FIG. ~~10~~ 8 in which the deposited SiO₂ film has a refractive index of 1.63. In this case, the amount of H₂O and OH incorporated into the SiO₂ film starts to increase again.--

The paragraph beginning at page 20, line 8, has been amended as follows:

--Next, in the step of FIG. 15F, an SiO₂ film 14 is deposited on the structure of FIG. 15E by a plasma CVD process with a thickness of about 20nm.

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Thereby, the deposition of the SiO₂ film 14 is conducted in a parallel-plate-type plasma CVD apparatus under a pressure of 3.0 Torr while setting the substrate temperature to 400°C and the high-frequency power to ~~50 kW~~ 50W. During the deposition of the SiO₂ film 14, SiH₄ and N₂O are supplied to the reaction chamber of the plasma CVD apparatus as source materials together with an N₂ carrier gas with a flow rate of 10cc/min and 400cc/min respectively. The flow rate of the N₂ carrier gas may be set to 2000 cc/min. The plasma CVD apparatus may have an electrode gap of 300 Mil.--

The paragraph beginning at page 27, line 9, has been amended as follows:

--Thus, the deposition of the oxide film 29 is conducted in a parallel-plate-type plasma CVD apparatus at a substrate temperature of 400°C while setting the high-frequency power to ~~50 kW~~ 50W. During the deposition of the oxide film 29, the internal pressure of the reaction chamber of the plasma CVD apparatus is set to 3.0 Torr and SiH₄ and N₂O are supplied as the gaseous source together with an N₂ carrier gas with respective flow rates of 10 cc/min and 400 cc/min. The flow rate of the N₂ carrier gas is set to about 2000 cc/min. Similarly as before, the gap between the electrodes of the plasma CVD apparatus is set to 300 Mil. As the formation of H₂O in the plasma is suppressed in the plasma CVD process conducted under the foregoing conduction, the SiO₂ film 29 thus obtained

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typically has an H₂O content of 1.1 wt% or less and a refractive index of about 1.47.--

IN THE CLAIMS:

Claim 28 has been amended as follows:

28. (Twice Amended) A semiconductor device, comprising:
- a substrate;
 - a gate electrode provided on said substrate;
 - a diffusion region formed in said substrate adjacent to said gate electrode;
 - a side-wall insulation film formed on a side wall of said gate electrode;
 - a self-aligned contact hole defined by said side-wall oxide film and exposing said diffusion region; and
 - a silicide region formed selectively on a surface of said diffusion region;
- wherein said semiconductor device further includes;
- a first insulation film provided on said gate electrode so as to cover said side wall oxide film partially;
 - a second insulation film having a composition different from a composition of said first insulation film and provided on said first insulation film;

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an interlayer insulation film deposited on said second insulation film;
a contact hole formed in said interlayer insulation film, said contact hole
extending through said first and second insulation films and exposing said self-aligned contact
hole;
said first insulation film ~~contacts~~ contains H₂O with an amount smaller than about
2.4 wt%.